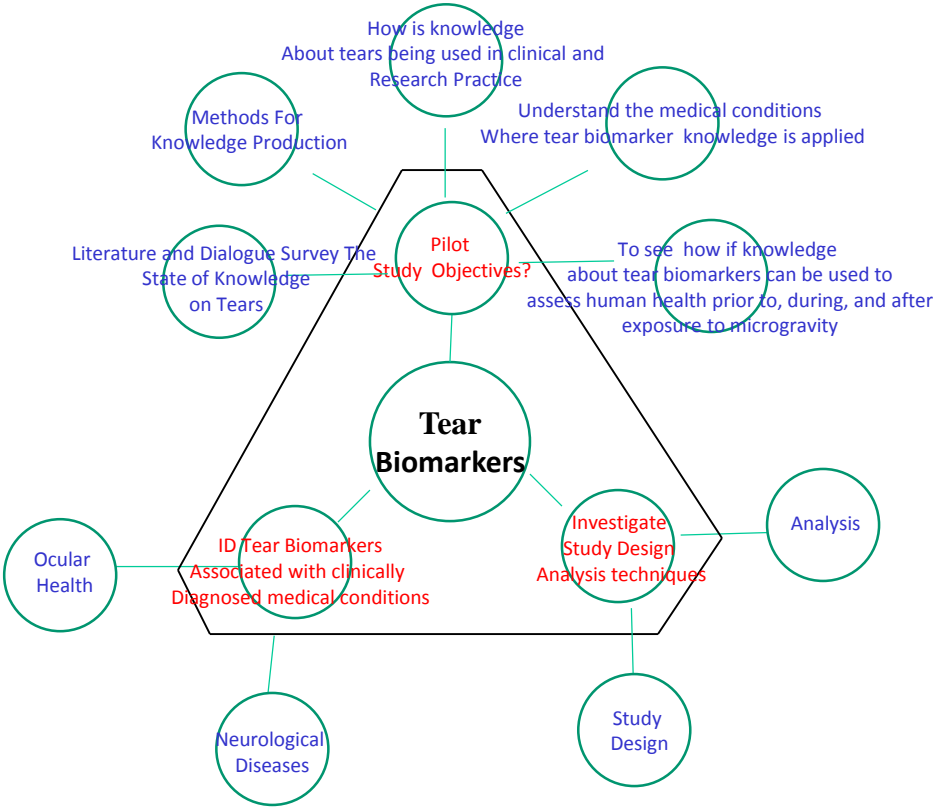


Investigation of Tear Biomarkers as an Indicator of Human Health

Abstract



A Pilot Study on the Investigation of Tear Biomarkers as an Indicator of Human Health

Abstract

Scientific literature suggests that tear biomarkers can be used as a guide towards clinical diagnosis of human health (Hagan et al., 2016). This study will investigate whether tear biomarkers represents a research and clinical opportunity to assess human health prior to, during, and after exposure to the spaceflight environment. The focus of this study is to compare biomarkers previously identified as potentially relevant to both ocular and brain health against unique physiological outcomes of exposure to the space flight environment.

Study subjects suffering from terrestrial conditions thought to be similar to Spaceflight Associated Neuro-ocular Syndrome (SANS: formerly VIIP), e.g. patients with idiopathic intracranial hypertension (IIH) and optic neuritis may be relevant to conditions associated with spaceflight. This study will review methodologies, tear biomarkers related to state of ocular and brain health, the strengths and weakness of using tear fluid biomarkers versus other body fluid samples, and will survey current tear fluid biomarker knowledge in research and clinical practice.

A strength of using tear biomarkers is that sampling is non-invasive and used as a guide in understanding pathologies, including ocular and systemic inflammatory conditions (Cocho et al., 2016), Salvisberg et al., 2014). Moreover, tear biomarkers may reflect diseases affecting the central nervous system (CNS) (Salvisberg et al., 2014). For example, in multiple sclerosis (MS), the concordance rate between tear biomarkers versus cerebrospinal fluid (CSF) is approximately 83%, indicating that, in the majority of cases, tears are at least as effective as CSF in potentially identifying novel MS biomarkers (Devos et al., 2001).

Key Words

Tear fluid, biomarkers, diagnosis, inflammation, ocular, brain health.

Note. See attached Microsoft power point slide two for further breakdown.

References

Hagan, Suzanne, Eilidh Martin, and Amalia Enríquez-de-Salamanca. Tear fluid biomarkers in ocular and systemic disease: potential use for predictive, preventive and personalised medicine. *EPMA J*, 2016; 7:15.

Cocho L, Fernández I, Calonge M, Martínez V, González-García MJ, Caballero D, López-Corral L, García-Vázquez C, Vázquez L, Stern ME, Enríquez-de-Salamanca A. Biomarkers in Ocular Chronic Graft Versus Host Disease: Tear Cytokine- and Chemokine-Based Predictive Model. *Invest Ophthalmol Vis Sci*. 2016; 57(2):746-58.

Salvisberg, C., Tajouri, N., Hainard, A., Burkhard, P.R., Lalive, P.H. and Turck, N., 2014. Exploring the human tear fluid: discovery of new biomarkers in multiple sclerosis. *Proteomics-Clinical Applications*, 8(3-4), pp.185-194.

Devos, D., G. Forzy, J. de Seze, S. Cailleux, P. Louchart, Ph Gallois, and P. Hautecoeur. Silver stained isoelectrophoresis of tears and cerebrospinal fluid in multiple sclerosis. *J. Neurology*. 2001; 248(8):672-675.

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